

3

12; 16 denotes the filling surface of the housing 12 to the throttle body 1.

Hereunder, we will explain how to adjust the initial value of the rotational angle  $\theta$  of the throttle valve spindle 3; namely, the minimum value of the electric signal  $V_0$  is expressive of the rotational angle  $\theta$  through the fine adjustments of the fitting position of the housing 12 and is obtained by rotating the two adjustment slots 14 around the two fitting screws 13, respectively, referring to FIGS. 4, 6 and 1. When the position of the housing 12 is finely adjusted in  $C_1$  and  $C_2$  directions as shown in FIG. 4 on the basis of the adjustment slots 14 of the housing 12, the brushes 7 held in sliding contact with the resistors 9 moves on the resistors 7 shown in FIG. 6, whereby the voltage division ratio 17 of resistances is changed to generate the electric signal  $V_0$ . When the rotational directions  $C_1$  and  $C_2$  of the adjustment slots 14 shown in FIG. 4 are, for instance, clockwise, the brushes 7 shown in FIG. 6 are moved in the up and down directions, respectively corresponding to the movement of the rotational directions  $C_1$  and  $C_2$ , respectively. FIG. 6 shows the example in which the initial positions of the brushes 7 are on the side of the earth GND, and the minimum value or initial value of the electric signal  $V_0$  is finely adjusted. The housing 12 and the throttle body 1 are tightly sealed by an O-ring 18.

According to the embodiment, the brushes 7 are mounted on the throttle valve spindle 3 of the throttle body 1 through the holder 6. Therefore, the throttle sensor has the effect that the sensor element dispenses with bearings for receiving the throttle valve spindle etc., a joint, and so forth. As another effect, the arrangement of the brushes 7 on the outer side of the holder 6 on the side remote from the throttle body leads to the easiness of the mounting of the housing 12 on the throttle body 1 and the easiness of the holding of the contact pressure between the brushes 7 and the resistors 9.

Since the present invention is constructed in such a manner that the throttle body is formed uniformly together with the throttle sensor, it achieves effects as stated below. The brushes are mounted on the throttle valve spindle of the throttle body through the holder, so that bearings for receiving the throttle valve spindle etc., a joint, and so forth as a stand-alone type sensor shown by the prior art mentioned before are dispensed with to simplify a sensor structure. Moreover, the arrangement of the brushes on the outer side of the holder, namely on the side remote from the throttle body, leads to the easiness of the mounting of the housing on the throttle body and the easiness of the holding of the contact pressure between the brushes and the resistors.

What we claim is:

1. A contact type throttle sensor for detecting a rotational angle of a throttle valve spindle rotatably mounted in a throttle body of an internal combustion engine comprising:

a holder fixed to one end of said throttle valve spindle and having a brush which rotates along a predetermined path together with said throttle valve spindle;

4

a circuit board having a resistor mounted thereon for contact with said brush and which is positioned perpendicular to the axial direction of said throttle valve spindle; and

a housing holding said circuit board and being furnished with a lead frame and a connector for relaying an electric signal of said resistor, said housing being detachably fixed to said throttle body; wherein said housing further comprises means for adjusting a position of said brush with respect to the resistor.

2. A contact type throttle sensor according to claim 1, wherein a first surface of said holder is adjacent to said throttle body, said brush being located on a second surface of the holder facing in a direction opposite to said first surface.

3. A contact type throttle sensor according to claim 2, wherein said brushes are located adjacent to a rim of said holder.

4. A contact type throttle sensor according to claim 1, wherein said holder is located within a recess of said throttle body, and said circuit board is fixed to said housing which engages in said recess said recess and said housing being dimensional, whereby said brushes hold a predetermined contact pressure with said resistor when said housing is engaged in said recess.

5. A contact type throttle sensor according to claim 1, wherein said housing forms a unitary structure with said circuit board, said lead frame and said connector.

6. A contact type throttle sensor according to claim 1, wherein said adjusting means comprises adjustment slots for finely adjusting the position of said housing on said throttle body to produce an initial value of the electric signal corresponding to the rotational angle of the throttle valve spindle.

7. A contact type throttle sensor as in claim 6 wherein said at least two adjustment slots comprise unloaded holes.

8. A contact type throttle sensor according to claim 1, wherein said resistors comprises electrically conductive plastic.

9. A contact type throttle sensor as in claim 1, wherein said adjusting means moves said resistor either up or down with respect to said brush.

10. A contact type throttle sensor as in claim 1, wherein said circuit board is ceramic.

11. A contact type throttle sensor for detecting a rotational angle of a throttle valve spindle rotatably mounted in a throttle body of an internal combustion engine comprising:

a holder being fixed to one end of said throttle valve spindle and having a plurality of brushes which rotate along a predetermined path together with said throttle valve spindle;

a circuit board having a plurality of resistors mounted thereon for contact with said plurality of brushes and located on a plane substantially perpendicular to the axial direction of said throttle valve spindle; and

a housing holding said circuit board and having a lead frame and a connector for transmitting an electric signal of said resistors, said housing being detachably fixed to said throttle body;

wherein said housing forms a unitary structure with said connector.

12. (new) A contact type throttle sensor according to claim 11, wherein said housing further forms a unitary structure with at least one of said lead frame and said circuit board.

13. (new) A contact type throttle sensor according to claim 11, wherein said housing is sealed with respect to said throttle body by a sealing member.

14. (new) A contact type throttle sensor according to claim 13, wherein said sealing member is an O-ring seal.

15. (new) A contact type throttle sensor according to claim 13, wherein said lead frame enables electrical connection between at least one of said plurality of resistors of said circuit board and said connector, and said lead frame extends beyond said sealing member.

16. (new) A contact type throttle sensor for detecting a rotational angle of a throttle valve spindle rotatably mounted in a throttle body of an internal combustion engine comprising:

a holder being fixed to one end of said throttle valve spindle and having a plurality of brushes which rotate along a predetermined path together with said throttle valve spindle;

a circuit board having a plurality of resistors mounted thereon for contact with said plurality of brushes and located on a plane substantially perpendicular to the axial direction of said throttle valve spindle; and

a housing holding said circuit board and having a lead frame and a connector for transmitting an electric signal of said resistors, said housing being detachably fixed to said throttle body;

wherein said housing is sealed with respect to said throttle body by a sealing member.

17. (new) A contact type throttle sensor according to claim 16, wherein said sealing member is an O-ring seal.

18. (new) A contact type throttle sensor according to claim 16, wherein said housing forms a unitary structure with said connector.

19. (new) A contact type throttle sensor according to claim 16, wherein said lead frame enables electrical connection between at least one of said plurality of resistors of said circuit board and said connector, and said lead frame extends beyond said sealing member.